



**Yarra Integrated Water  
Management Forum**

# **Strategic Directions Statement**

**DRAFT 3.0**

**Presented to the Third Yarra IWM Forum for Endorsement  
31 July 2018**

Supported by



Environment,  
Land, Water  
and Planning

### **Acknowledgment of Victoria's Aboriginal communities**

The Victorian Government proudly acknowledges Victoria's Aboriginal communities and their rich culture; and pays its respects to their Elders past and present. The government also recognises the intrinsic connection of Traditional Owners to Country and acknowledges their contribution in the management of land, water and resources.

We acknowledge Aboriginal people as Australia's first peoples and as the Traditional Owners and custodians of the land and water on which we rely. We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life and how this enriches us. We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

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**Front cover** design forthcoming

**Inside cover** design forthcoming

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# Foreword

## DRAFTING NOTE

SDS Foreword - author TBC

## Acknowledgements

The inaugural Yarra Integrated Water Management Forum was convened in December 2017 with subsequent Forums meeting throughout 2018 to discuss and prioritise integrated water planning and management in the Yarra Forum Area. The Forum Area encompasses Victoria’s capital, Melbourne, the economic and employment hub of the state. One third of Victorians reside in the Yarra catchment. It is home to one of Australia’s most iconic and culturally significant waterways, the Yarra River, which flows from its near natural upper reaches in the forested Yarra Ranges down to Port Phillip Bay. The Yarra Forum Area will continue to experience substantial population and economic growth in the coming years. The preservation and management of the catchment’s landscapes will have a positive impact on the region’s world-renowned liveability and the long-term health and security of its waterways.

The Forum covers the traditional lands of Kulin Nation, including the Wurundjeri people. The Forum Area is abundant in Aboriginal cultural sites with a majority of these found near waterways and the coast. The Department of Environment, Land, Water and Planning acknowledges these Traditional Owners as traditional custodians who have managed land and water sustainably over thousands of generations and maintain an active connection to Country.

The Yarra Integrated Water Management Strategic Directions Statement has been developed by the Yarra Integrated Water Management Forum. Members of this Forum include the Chief Executive Officers and Managing Directors of the following organisations:

Banyule City Council	Glen Eira City Council	South East Water Corporation
Boroondara City Council	Hume City Council	Southern Rural Water Corporation
Bunurong Land Council Aboriginal Corporation (LCAC)	Manningham City Council	Stonnington City Council
Cardinia Shire Council	Maroondah City Council	Victorian Planning Authority
City of Melbourne	Melbourne Water Corporation	Whitehorse City Council
City of Port Phillip	Mitchell Shire Council	Wurundjeri Land and Compensation Cultural Heritage Council Aboriginal Corporation
City of Whittlesea	Monash City Council	Yarra City Council
City West Water	Moreland City Council	Yarra Ranges Council
Darebin City Council	Nillumbik Shire Council	Yarra Valley Water
Department of Environment, Land, Water and Planning (DELWP)	Port Phillip and Westernport Catchment Management Authority (PPWP CMA)	

# Chapter 1

*An unprecedented opportunity to progress water cycle planning and management in Victoria through collaboration.*

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## DRAFTING NOTE

Chapter layout and spread TBC

# Introduction

## Overview

The Yarra catchment is a richly diverse geographic area encompassing some of Victoria's most iconic landscapes and waterways. Magnificent old growth woodlands, lush rainforests and protected riverine environments meet fertile agricultural lands and populous cities throughout this vast region. Victoria's coastal capital, Melbourne, sits within the catchment and represents one of several Victorian cities undergoing rapid transformation. Considered alongside challenges posed by global climate change, growth and development is impacting on the health of waterways entering both the Yarra River and Port Phillip Bay. Balancing the needs and function of Yarra's water cycle with future growth and development is a complex challenge requiring careful management.

The region's water sector, local governments and Traditional Owners are working collaboratively to plan and deliver projects and strategies that will enhance the resilience and liveability of the Yarra catchment and deliver enduring environmental, economic and social benefits to local communities. Through ongoing engagement with their communities, these organisations have heard that thriving waterways are inextricably linked to community identity, amenity, value and sustained economic benefit for the Yarra catchment.

The way in which land use and water planning occurs will be fundamental to ensuring these aspirations are realised.

The water cycle in the Yarra catchment is overseen and managed by several agencies. Enhanced communication and collaboration is required to ensure plans and investments are optimised to enable shared community outcomes.

This approach is Integrated Water Management (IWM). A central premise of IWM is the overall acceptance that achieving liveability and resilience is a shared responsibility.

The *Integrated Water Management Framework for Victoria 2017* is designed to help local governments, water corporations, catchment management

authorities, Traditional Owners and other organisations work together to ensure the water cycle efficiently contributes to the urban liveability of the region, with communities at the centre of decision-making.

To assist with this, IWM Forums have been established across the state to identify, prioritise and

*Integrated Water Management is a collaborative approach to water planning and management that brings together organisations with an interest in all aspects of the water cycle. It has the potential to provide greater value to our communities by identifying and leveraging opportunities to optimise outcomes.*

oversee the implementation of critical collaborative water opportunities.

## What is a Strategic Directions Statement?

This Strategic Directions Statement (SDS) articulates the regional context, shared vision and strategic water-related outcomes for the Yarra catchment.

It outlines a range of strategic policy and framework enablers for putting IWM into practice, as identified by the IWM Forum members across Victoria.

This SDS also includes a prioritised list of IWM projects and strategies developed in collaboration by the Yarra IWM Forum partners.

Partners of the Yarra IWM Forum are committing their best endeavours to:

- Ensure priority projects and strategies are progressed in line with the shared vision and strategic outcomes of the Yarra catchment; and
- Support DELWP to progress priority strategic enablers for IWM in Victoria.

It is envisaged that the SDS will be a living document which will be updated to reflect the Yarra IWM Forum's current priorities and opportunities.

## Enduring Collaboration

### How we're working together

The Yarra IWM Forum identifies, coordinates and prioritises areas that would most benefit from collaborative and place-based water management planning and projects.

The Forum brings together 29 organisations with an interest in water cycle management. These organisations include five water corporations, 19 local governments, the Port Phillip and Westernport Catchment Management Authority, representatives of Traditional Owner interests, the Department of Environment, Land, Water and Planning (DELWP) and the Victorian Planning Authority.

To ensure IWM is successful and enduring across the region, the Yarra IWM Forum partners commit to promote a collaborative and shared values culture within their own organisations and through their work with local communities and water cycle delivery partners

The Yarra IWM Forum is governed by an open and transparent IWM planning process.

This process assumes a holistic, whole-of-cycle approach to determine water cycle solutions, considering regulatory accountabilities and service delivery responsibilities.

Each organisation has an important role to play in the decision-making and management of the catchment's water, resources and assets.

Collaboration across IWM Forum partners will ensure balanced consideration of the complex economic, environmental, cultural and community benefits and impacts associated with the range of proposed IWM projects and strategies. This collaborative process allows for integrated solutions that respond to individual business needs, as well as the needs of the broader catchment.

The Yarra IWM Forum partners will continue to work together to build inter-organisational trust and develop productive, enduring relationships to realise the shared vision for integrated water management and delivery in the Yarra catchment.

Further information on the IWM Forum's governance and planning framework is outlined in the *Integrated Water Management Framework for Victoria 2017*, available on the internet at [www.delwp.vic.gov.au](http://www.delwp.vic.gov.au).

## Recognising Aboriginal values in water planning and management

The Yarra IWM Forum is committed to working in partnership with Aboriginal Victorians across landscapes, communities and natural resources.

The Forum recognises that Traditional Owners throughout the metropolitan Melbourne catchments, including the Wurundjeri, Bunurong and Wathaurung people of the Kulin Nation, are unique to Country and their involvement in IWM planning will be specific to each planning area.

Organisations involved in IWM have obligations to involve Traditional Owners and consider Aboriginal values in their organisational activities. The Forum will continue to work with Traditional Owner groups to determine the appropriate approach and level of involvement in the broader IWM planning process for each Forum Area.

### DRAFTING NOTE

Insert IWM planning process  
(governance illustration)

ILLUSTRATION / DIAGRAM FOR IWM  
PLANNING & GOVERNANCE PROCESS

## Guiding principles for collaboration

The purpose of the Yarra IWM Forum is to provide a collaborative platform for overseeing, supporting and, where necessary, facilitating water's contribution to resilience and liveability in Victoria.

Applying an Integrated Water Management (IWM) approach, the Forum will:

- Consider the collective community needs in the regional context and develop an overall strategic direction accordingly
- Complement and feed into existing water and land planning processes, collaborative networks, forums and associations
- Commit best endeavours to facilitate multi-stakeholder initiatives, share organisational expertise and advance sectoral learnings
- Respect Traditional Owner rights in water management planning
- Ensure multiple benefits can be delivered to the community and the economy
- Optimise investment in water management projects and strategies to deliver multiple benefits and best community value solutions

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# Chapter 2

*Understanding why an integrated approach to water planning and management is critical to achieve better economic, environmental, cultural and community outcomes for the Yarra catchment.*

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## Regional Context

The Yarra IWM Forum Area covers an extraordinarily diverse area encompassing an array of culturally, environmentally and economically significant landscapes, as well as one of the world’s most liveable cities in the Victorian capital, Melbourne. The catchment spans approximately 4,076 km<sup>2</sup>, extending from Melbourne’s CDB in the south, north to the southern slopes of the Great Dividing Range. The eastern extent of the Forum Area follows through the foothills of the Victorian Alps to the surrounding Yarra Ranges National Park.

The Yarra catchment includes one of Australia’s most iconic and culturally significant waterways, the Yarra River, which flows from its near natural upper reaches at Mt Baw Baw in the Yarra Ranges throughout the catchment to Port Phillip Bay.

The landscape of the Yarra catchment varies greatly from ancient woodlands, lush rainforests, grasslands and fertile agricultural lands, to Melbourne’s densely populated and developed urban areas extending from central Melbourne.

The region sustains a range of leisure and recreational activities, including tourism, camping, cycling, hiking, boating and rowing. A strong service-based economy is characteristic of urban areas in the catchment whilst industry, construction, agriculture and viticulture are prevalent elsewhere.

The catchment includes areas of significant value where Aboriginal people once lived, camped and foraged. The Yarra River formed the lifeblood of many indigenous communities and continues to hold significant value for culture and storytelling.

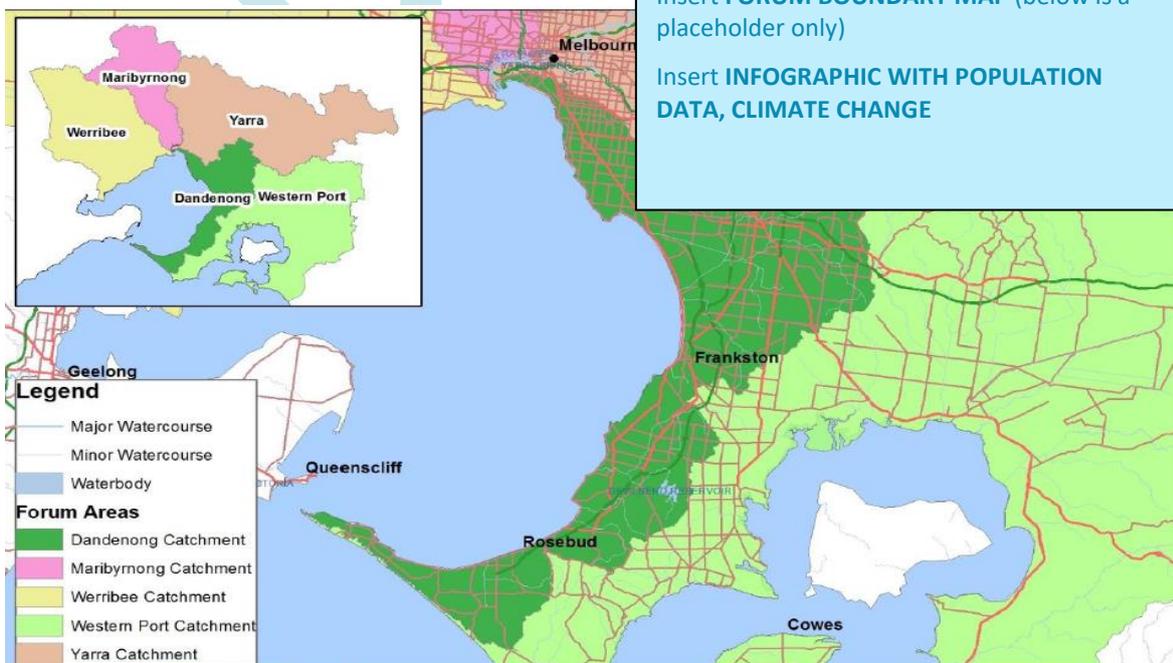
## Population

The Yarra IWM Forum Area is home to one third of Victoria’s population, or approximately 1.8 million people. The catchment’s population is predicted to reach 2.6 million by 2040. Substantial urban and greenfield growth will occur here in the next two decades. Expanding satellite cities at Parkville, La Trobe and Monash will soon support more residents and provide employment opportunities for tens of thousands of people. The densification of inner Melbourne and middle ring suburbs, coupled with rapid growth through outer catchment areas, including Craigieburn, Kalkallo, Wallan and Lilydale, highlights the need for integrated catchment planning and management to maintain and improve liveability for community wellbeing and economic prosperity.

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Insert **FORUM BOUNDARY MAP** (below is a placeholder only)

Insert **INFOGRAPHIC WITH POPULATION DATA, CLIMATE CHANGE**



## Climate Change

Together with the major population increases anticipated over the next two decades, climate change presents a critical challenge for the Yarra catchment. By 2040, temperatures across the region are expected to rise by an average of 1.3°C under a medium climate change scenario. The risk of fire in forests and grasslands in upper areas of the Yarra catchment will remain high under these conditions. The impact of the urban heat island effect will also increase, with greater density urban areas experiencing higher heat vulnerability than more rural areas. At present, heat waves in Melbourne have a greater negative effect on population health than any other climate-related issue. The ongoing availability of water in the environment will be vital to reduce the risk of heat stress and improve cooling in the most vulnerable areas of the catchment.

Whilst the region is predicted to see more frequent and intense rainfall events that will increase the risk of flooding, the Yarra catchment will experience a reduction in average annual rainfall by 2040. This change is consistent with conditions predicted across the state as Victoria becomes warmer and drier. Less rainfall in the future, combined with increased development and growing populations, will place more pressure on water services in the catchment.

Projections for Victoria's future climate indicate an increase in the frequency and intensity of wildfires for rural parts of the Yarra catchment and neighbouring regions in Australia's southeast. The increased risk of bushfire poses a serious threat to the catchment's communities, infrastructure and high-value native forests and ecosystems.

A warming world will also impact the health and quality of waterways in the Yarra catchment. Increased stormwater flows from intense rainfall events, combined with excessive sediments in rivers and creeks, will impact natural ecosystems and marine environments reliant on the Yarra catchment's river system, including the Yarra River, as well as Port Phillip Bay. Opportunities to mitigate the effects of climate change through the preservation and management of Yarra's waterways and landscapes will have a positive effect on environmental and human health and the catchment's long-term resiliency.

### DRAFTING NOTE

Call out box:

To meet the challenge of climate change and prepare Victoria's water system for a range of possible climate futures, **climate change mitigation and adaptation actions will be embedded in all IWM Forum decisions.**

## Vision and Outcome Areas

***Working together, Yarra is a world-leading water sensitive catchment and our communities are healthy and thriving. We honour the land and the water of the Birrarung and its tributaries as the lifeblood of the catchment.***

### Collaboration to develop the shared vision and strategic outcome areas

The IWM Forum demonstrates a robust and transparent process of collaboration amongst local governments and a range of stakeholders with an interest in water.

Central within this process are the community values, local interests and place-based opportunities represented by each Forum member organisation.

The IWM Forum recognises the valuable contribution of these many and diverse actors in supporting a transformative approach to the planning and management of our wider water cycle. Each of these organisations played a leading role in determining a shared vision for IWM unique to each of the five metropolitan Melbourne catchments.

The seven primary strategic outcome areas to achieve this vision, as well as the secondary outcome areas nested beneath each primary area, were developed collaboratively by the IWM Forum partners.

These outcomes acknowledge the breadth of water plans, environmental strategies and land use plans developed by each partner organisation.

## IWM Strategic Outcomes

The Yarra catchment is seeking to achieve seven strategic outcomes through IWM.

Each of these will have a significant role in shaping the liveability, prosperity and resilience of Victoria's cities and towns.

These outcome areas provide a guide to identify and assess the various IWM opportunities included in Chapter 3 of this SDS.

 Safe, secure and affordable supplies in an uncertain future	 Effective and affordable wastewater systems	 Opportunities are optimized to manage existing and future flood risks and impacts	 Healthy and valued waterways and marine environments	 Healthy and valued urban and rural landscapes	 Community values are reflected in place based planning	 Jobs, economic growth and innovation
A diverse range of water supplies and resources for human, urban, industrial and agricultural consumption	Protect public health and deliver environmental outcomes and contribute to local amenity and communities	Appropriate levels of flood protection areas across the catchment including climate sensitivity modelling	Waterbodies across the catchment are managed for long term ecological resilience, balancing the needs for regional flood mitigation, environment, agriculture, industry and urbanisation	Active and passive recreation supported by water Improved connectivity and access for active transport links including along waterway corridors	Diverse urban landscapes that reflect local conditions and community values	Jobs and economic growth and innovation are supported by the water sector
Appropriate policy and regulation to enable water quality to meet regulatory standards and community expectations	Fit for purpose sewerage systems service the community's expectations	Community and property resilient to local flood risk and informed of increased impacts under climate change	Waterways across the catchment are managed to maintain and improve coastal and marine ecosystems in Port Phillip Bay	Retains water in the landscape for cooler, greener cities and towns	Empowered and engaged community involved in creating great places Local water related risks and issues understood and managed	Innovative planning and operation supports optimised investments
Timely collaborative planning and management of water in its entirety	Maximise resource opportunities to minimise waste and emissions	Multi scale responses addressing different levels of risk	Manage impacts of nutrients, sediment, litter, and other pollutant discharges to both waterways and Port Phillip Bay	Waterways and coastal environments accessible as valuable open space	An engaged, knowledgeable and water literate community in the Yarra catchment acts to protect and promote waterway values	Strong governance, collaboration and performance, including organisations that lead/influence planning processes
Secure fit for purpose water supplies for underpinning prosperity Water protects green assets that enhance our community spaces		Maximise multiple benefits when mitigating flood risk (i.e. maximise adaptation measures).	Traditional Owner and Aboriginal values, knowledge and practices are integrated and protected in waterway management and planning	Aboriginal cultural values associated with landscapes and waterways protected	Planning and regulatory frameworks align to achieve community place based objectives	Stronger collegiate engagement with Traditional Owners and Aboriginal Victorians to create employment and economic opportunities that lead to stronger communities
				Balancing competing objectives to achieve ecological and human health outcomes through landscapes		Recognising the value of water to leverage other investments

**DRAFTING NOTE**  
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 Consider 2-page spread

## The Case for IWM in the Yarra catchment

Over the coming years, unprecedented change and growth in the Yarra catchment will put pressure on its water cycle and resources, impacting urban and rural landscapes and communities, areas of natural vegetation, marine environments and industries. Translating community objectives for water management into practice will involve working across organisational boundaries to achieve the following strategic outcomes. These outcomes are aligned with those reflected in the strategic plans and environmental strategies of the Forum's partner organisations.

### Safe, secure and affordable supplies in an uncertain future

Five water corporations oversee water supply for the Yarra catchment: Melbourne Water, City West Water, South East Water, Southern Rural Water and Yarra Valley Water. The catchment contains several reservoirs, including Upper Yarra, Yan Yean, Maroondah and Sugarloaf, supplying the majority of metropolitan Melbourne water users. The Yarra River's near natural upper reaches in the mountain ash forests of the Yarra Ranges feed nine of Melbourne's major reservoirs, supplying 70 per cent of the city's drinking water.

Changes to the water cycle driven by anticipated population growth and climate change means more water will be needed across the catchment for urban, agricultural and environmental flow purposes. The catchment's residential population is expected to grow by 140 per cent by 2040, emphasising the need to diversify the water supply system and reduce dependency on reservoirs. There is an opportunity now to plan for the provision of secure water supplies for existing communities, industries and developing precincts into the future.

### Effective and affordable wastewater systems

Much of the Yarra catchment's urban wastewater is treated at either the Western Treatment Plant, located in Werribee, or the Eastern Treatment Plant, located in Bangholme, a southeast suburb of Melbourne. Both plants are operated by Melbourne Water.

Some of the catchment's wastewater is treated locally at various regional sewage treatment plants, including a number of Yarra Valley Water facilities.

The provision and efficacy of wastewater management services vary across the catchment. More than 14,000 properties in Yarra's outer northern and eastern suburbs use on-site domestic wastewater systems, or septic tank systems. Many of these are poor-performing and have the potential to pollute waterways, impacting public and environmental health.

In rural townships and less developed areas of the catchment, existing sewer capacity is constrained, with some areas managing wastewater through on-site wastewater management systems. In new growth areas, including the five precincts encompassing Fishermans Bend which will be home to an estimated 80,000 residents, planning for effective wastewater management will support a range of waste-to-resource opportunities for improved public health and environmental outcomes.

### Opportunities are optimised to manage existing and future flood risks and impacts

Since the early settlement of Melbourne on the banks of the Yarra River, the changing flows of the Yarra system have shaped how and where the city developed. Parts of the Yarra catchment remain prone to riverine flooding during periods of heavy and prolonged rainfall.

The Yarra catchment's biggest floodplain is 40 km long and stretches from Yarra Junction to Yering Gorge. The floodplain gives the world-famous Yarra Valley wine region its productive soils.

In recent decades, flows through the Yarra system have become highly regulated due to the construction of major water storages that capture natural run-off and allow for the controlled removal of water for consumptive use.

Stormwater flooding is prevalent in urban areas of the catchment. The ongoing development and growth of suburbs in metropolitan Melbourne contributes higher volumes of stormwater during periods of heavy rain, impacting the waterway health of the Yarra River and its tributaries.

There is a need to investigate improved floodwater harvesting capabilities in the Yarra catchment, particularly in developing urban centres where impervious areas and obstructions to flow paths, such as buildings, can alter the course of floodwaters and lead to increased risk and costs of property and infrastructure damage.

Re-use of stormwater will also support the maintenance of water-reliant facilities and amenities, such as irrigating sporting fields and gardens, and reduce demand on drinking supplies.

### Healthy and valued waterways and marine environments

The Yarra catchment contains an array of significant and biologically diverse waterways ranging from expansive rivers with variable flows to small ephemeral creeks and streams. All major waterways in the catchment eventually join the Yarra River, the largest river in Victoria. The Yarra flows 242 km from its origins in the forested Yarra Ranges National Park, located in north-eastern Victoria on the southern slopes of the Great Dividing Range. The river winds its way through metropolitan Melbourne, finally meeting the Maribyrnong River at the northernmost entry to Port Phillip Bay.

The Yarra River holds high cultural, social, economic and environmental value. It is designated as a Victorian Heritage River Area between Warburton, in the eastern central reaches of the Yarra catchment, and Warrandyte, 24 km northeast of Melbourne. Other notable waterways in the catchment include the O'Shannessy River, Little Yarra River, Woori Yallock Creek, Watts River, Plenty River, as well as the Merri Creek and Darebin Creek.

In general, the water quality in the upper reaches of the Yarra catchment is good, however water quality for waterways located in urbanised and industrial areas within the mid and lower catchment declines significantly. Stormwater is one of the major sources of pollution to waterways in the region, transporting elevated levels of nitrogen and other nutrients, sediment and litter into Port Phillip Bay. Above average rainfall during 2016-2017 and associated runoff resulted in a slight decline in overall water quality in the Yarra catchment.

According to the 2016-2017 environmental report card for the catchment's waterways developed by the Environment Protection Authority Victoria, Melbourne Water and DELWP under the *Yarra and*

*Bay Action Plan (2012-2017)*, approximately 43 per cent of waterways in the Yarra catchment are in very poor condition, with just over 3 per cent rated as near-natural and high quality. Over one quarter of waterways in typically rural areas on the urban fringe of the catchment are in good condition, meeting Victorian water quality standards.

IWM outcomes to achieve healthy and valued waterways and marine environments in the Yarra catchment complement Melbourne Water's draft *Healthy Waterways Strategy 2018*. The strategy focuses on protecting and improving waterways in the Port Phillip and Westernport region on behalf of the community. It identifies a range of priority areas and management actions for waterways, and many of these align with the strategic outcome areas and IWM opportunities identified by the Yarra IWM Forum Members and further detailed in Chapter 3.

The Yarra system holds significant recreation, nature conservation, scenic and cultural heritage attributes, supporting a range of iconic Australian animal species. These include the critically endangered Leadbeater's possum, populations of platypus, a wide variety of birds, native fish and diverse populations of frog species.

Macroinvertebrate populations are generally high in the upper reaches of the Yarra system due to better water and vegetation quality.

Urbanisation and climate change present significant challenges to the health of the Yarra catchment's waterways and marine environments. Nearly all the Yarra River's major tributaries have been dammed or altered for agriculture and urban development. Water quality, salinity levels and reduced river flows during periods of drought have led to declining platypus populations in some parts of the catchment, as well as increased chance of algal blooms in others. There is an opportunity to incorporate improved planning and waterway protection controls as the catchment continues to urbanise.

A further area of opportunity involves managing sediment and pollution from the Yarra River and its tributaries to the receiving waters of Port Phillip Bay. At present, the catchment contributes approximately 32 per cent of the nitrogen inputs to Port Phillip Bay, the largest of all contributing catchments, impacting the health of the bay's diverse marine ecosystems.

## Healthy and valued urban and rural landscapes

The landscape of the Yarra catchment is widely diverse, ranging from agricultural areas, extensive natural woodlands, grasslands and cool temperate rainforests, to densely populated urban areas, including Melbourne's central business district (CBD) and residential suburbs accounting for 22 per cent of the region.

The catchment covers an area of approximately 4,076 km<sup>2</sup>, and the majority of this, 57 per cent, is devoted to agriculture and viticulture. The Yarra Valley is one of the catchment's most fruitful growing areas, producing nursery plants and cut flowers, fruits and vegetables, dairy products and acclaimed cool climate wines. A further 21 per cent of the catchment has retained its natural vegetation and supports a diverse range of flora and fauna species. Spanning over 76,000 hectares across the upper reaches of the catchment, the Yarra Ranges National Park is home to a breadth of native plants, including Mountain Ash trees and verdant tree ferns. A diverse range of native animals and birds inhabit the area, including kangaroos, wallabies, wombats, echidnas, kookaburras, rosellas, lyrebirds and cockatoos.

The Yarra catchment encompasses part of Kinglake National Park, Mount Toolebewong State Forest, Kurth Kiln Regional Park, Plenty Gorge and Warrandyte State Park. In the mid and lower reaches of the catchment, extensive land clearing for rural and urban development has led to a decline in vegetation condition. Re-vegetation works aim to better connect habitats, stabilise animal populations and mitigate the heat island effect in developed areas.

The Yarra catchment continues to address challenges on the water cycle from increased pollution due to rapid urbanisation and agricultural activities which impacts the health of its urban and rural landscapes. The high value associated with waterways, green wedges and woodlands in the Yarra catchment has led to many councils prioritising the protection of these areas and environmental assets.

## Community values are reflected in place-based planning

The Yarra catchment area holds a wide range of values for Victorians, including agricultural, tourism, cultural heritage and recreation on and near the water's edge.

The catchment encompasses the Traditional lands of the Kulin Nation, including the Wurundjeri people. Archaeological evidence shows that Aboriginal people lived and prospered in the Yarra catchment for at least the last 30,000 years. More than 3,000 Aboriginal cultural sites have been recorded in the Yarra catchment, with a majority of these found within 100 m of a permanent watercourse, swamp or ephemeral creek.

Known as Birrarung, a Wurundjeri word meaning river of mists and shadows, the Yarra River holds significant value as a key part of indigenous culture and storytelling. The river is the centrepiece of Wurundjeri Country and served as a key site for conducting ceremony, trading, fishing and hunting.

Other places of significance for Aboriginal people include Yarra Bend Park where the Merri Creek meets the Yarra River, Dights Falls just downstream from this confluence, as well as the sacred domain of the Bolin Bolin Billabong in the City of Manningham.

Local governments are working alongside their communities to maintain and improve liveability and prosperity of the Yarra catchment's communities and waterways during periods of growth. Urban development, small lot densification, renewal areas and activity centre development will comprise 70 per cent of growth in the region. Along with the densification of Melbourne's inner and middle suburbs, including the new residential and employment clusters at Fishermans Bend, areas of growth include the Craigieburn-Mickleham and Wallan regions and the middle ring suburbs of Kilsyth and Lilydale.

There is an opportunity to integrate water planning and management with incoming infill and

### DRAFTING NOTE – call out box with photo

*A healthy and iconic river for all Victorians now and for the future*

The Yarra Strategic Plan is currently under development to ensure the long-term protection of the Yarra River (Birrarung).

The plan will give effect to a long-term community vision for the Yarra River and provide the basis for future planning of the river corridor and each of its reaches.

To deliver the plan and protect the Yarra River for future generations, *the Yarra River Protection (Willip-gin Birrarung Murrn) Act 2017* identifies the Yarra River and the many hundreds of parcels of public land it flows through as one living, integrated natural entity for protection and improvement.

Woi-wurrung language is used in the title of the Act in recognition of Traditional Owners' custodianship of the river and connection to the lands through which the river flows.

greenfield development through the Yarra catchment. Examples include stormwater harvesting to irrigate parklands and sporting fields, the provision of community amenities with water features and the maintenance of open space and green wedges to support environmental health, liveability, recreation and cooling in the landscape.

The Yarra catchment supports numerous local advocacy initiatives driven by, or involving, communities concerned with water cycle outcomes. These groups are active in land and waterway protection, riparian planting and land management, community education and advocacy for healthy and thriving waterways.

There is strong stakeholder and community support for a new approach to protecting and improving the Yarra River and its environs. Melbourne Water is working with representatives of Traditional Owner groups, communities, stakeholders and the Victoria Government on the development of the Yarra Strategic Plan, a key element of the *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017*. The Act strengthens the protection and management of the Yarra River and will help coordinate the responsible public entities that operate near its banks. The forthcoming *Yarra Strategic Plan* will provide a policy and planning framework to guide decision-making and provide future direction for land use and development in the river corridor. Ultimately, the Plan aims to maintain, protect and celebrate the Yarra River and its parklands as highly valued natural assets that are critical to the future liveability and prosperity of Melbourne and the Yarra Valley.

Other collaborative initiatives that seek to elevate community priorities and outcomes, as well as maintain a relationship with the Yarra IWM Forum, include Melbourne Water's Healthy Waterways Strategy Review and the Metropolitan Partnerships process. The Yarra catchment covers the Northern, Eastern and Inner Metropolitan Partnerships, an initiative that brings together community and business representatives with state and local governments to identify priorities for jobs, services and infrastructure within the region. Among a range of priorities, the Partnerships provide advice to ensure ongoing environmental benefits and connections to the environment within each region.

### **Jobs, economic growth and innovation**

The Yarra catchment includes a major growth corridor in northeast Melbourne comprising

several areas designated for significant population and economic growth. Three National Employment and Innovation Clusters (NEIC) are located within the Yarra Forum Area. The Parkville NEIC currently employs more than 40,000 people through a range of education, research, health, professional and technical industries. The La Trobe Employment Cluster is anticipated to grow from 35,000 people and 25,700 jobs currently to 100,000 people and 80,000 jobs in the future. Jobs and economic growth will also continue at the Monash NEIC, which has Melbourne's largest concentration of jobs outside the CBD. The Monash NEIC currently supports 75,000 jobs and contributes \$9.4 billion to the Victorian economy. The level and pace of growth in these areas will place greater pressure on the Yarra catchment's water systems and the security of supply to homes and businesses.

The second largest State Significant Industrial Precinct (SSIP) is found in the Yarra catchment at the Northern SSIP. This major industrial area is dominated by manufacturing, wholesaling and population services, and will continue to attract new investment and jobs to the Yarra catchment in the coming years.

The Yarra catchment also contains state and nationally significant infrastructure and commercial industries, including Melbourne's CBD, the economic and employment heart of Victoria. Major roads and public transport networks span the catchment and keep Victoria on the move. The majority of Victoria's internationally-renowned universities, sporting centres, cultural facilities and museums are located here, drawing millions of local and international visitors each year. The international and domestic freight and shipping at the Port of Melbourne and the Yarra Valley agricultural area are other notable contributors to the region's economy.

Tourism is major economic driver for the Yarra catchment. Direct tourism in Melbourne and its surrounds was worth \$8.1 billion in 2015-16, sustaining 81,900 jobs for people employed directly by the tourism industry. Including flow on effects on related industries, total tourism was worth \$15.3 billion to the region's economy.

Agriculture and viticulture are other significant drivers of economic prosperity for the Yarra catchment. The Yarra Valley's locally and internationally recognised fine food and wineries attract more than 4.5 million tourists each year.

Secure water supplies and innovative water management infrastructure to support the Yarra

catchment's key industries will be critical to its continued economic growth and success.

DRAFT

# Chapter 3

*A portfolio of priority IWM projects and strategies for which the Yarra catchment's collaborative partners have committed their best endeavours to progress.*

DRAFT

## DRAFTING NOTE

Chapter layout and spread TBC

The following portfolio of priority projects and strategies represents a suite of IWM opportunities for which the Yarra IWM Forum's collaborative partners are committed to progress within the next 12 to 18 months. The status of each IWM opportunity included in the Priority Portfolio reflects the phase of work to be undertaken in this time period.

Additional projects and strategies that are not yet committed are included in the Appendix of this SDS.

In developing this portfolio, the collaborative governance of the Forum recognises the water cycle complexities of the region and considers the balance of outcomes, opportunities, roles and responsibilities for Forum members and their communities.

A Forum Area (or catchment-wide) IWM Strategy is yet to be developed, however the Yarra IWM Forum has agreed to initiate development of a strategy over the next 12-18 months.

The projects and strategies listed within the Priority Portfolio have not been guided by an existing IWM Strategy, rather they were developed based on the experience and knowledge of the Forum Members, and in consideration of their potential to impact on the seven strategic outcomes for IWM sought for the Yarra region. In addition, consideration was given to the urgency of taking such actions, particularly where opportunities could be lost if no action was taken, as well as the level of commitment demonstrated by partner organisations to progress IWM initiatives over the next 12-18 months.

The projects and strategies within acknowledge a number of existing metropolitan-wide strategies and plans, such as the *Melbourne Water Systems Strategy* and the draft *Healthy Waterways Strategy 2018*, as well as the clear and measurable targets identified in the existing strategies. Targets may include alternative water use and stormwater harvesting and infiltration.

The IWM Forum recognises that the contribution of this Priority Portfolio to the seven strategic outcomes including the targets identified in the existing metropolitan-wide strategies has not yet been quantified. It is the intention of the Forum to consider a targeted evaluation of these IWM opportunities where the Forum agrees this is necessary. This work may occur in tandem with the development of a catchment-wide strategy.

The Forum acknowledges that this is a dynamic list of IWM opportunities and is subject to further

assessment by the IWM Forum Members. The organisations listed as collaborative partners in the IWM Priority Portfolio have been identified by the Forum Members as important stakeholders to progress the individual initiative. For initiatives in initial stages of development, additional stakeholders may be included as the project progresses.

By co-delivering a range of water planning and management initiatives, the Yarra IWM Forum seeks to build on the strengths of the community, the water sector and governments to achieve better value and long-term shared benefits for the region.

The Yarra IWM Forum presents an unparalleled opportunity for these organisations to build lasting partnerships across sectors and geographical boundaries to enhance, accelerate and generate greater visibility for water cycle initiatives that will improve Victoria's resilience and liveability.

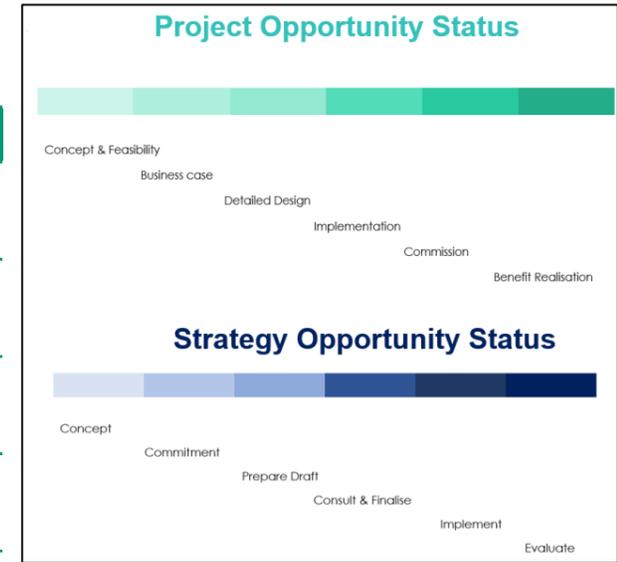
#### DRAFTING NOTE

Insert design/stylised overview table of projects

**DRAFTING NOTE**  
 Icons and layout to be finalised with designer. Icons to be shaded according to high, med, low impact against outcome area identified.

# IWM Project & Strategy Opportunities – Overview

IWM Opportunity	Strategic Outcomes	Location	Spatial Scale	Collaborative Partners	Status
Biodiversity Connections for Carbon-Neutrality		Yarra Forum Area		Port Phillip and Westernport CMA (PPWCMA), Melbourne Water, Yarra Valley Water, Bunurong Land Council Aboriginal Corporation (LCAC)	
Catchment-scale IWM Strategy		Yarra Forum Area		Yarra IWM Forum member organisations	
Chandler Park Wetlands		Chandler Park, Kew		City of Boroondara, Melbourne Water	
Coburg Stormwater Harvesting		Coburg		Moreland City Council, Melbourne Water, Yarra Valley Water, community groups	
Fishermans Bend IWM Plan		Fishermans Bend		South East Water, City of Melbourne, Melbourne Water, City of Port Phillip, Fishermans Bend Task Force, Bunurong LCAC	
Greening the Greyfields		Ringwood		Maroondah City Council, Swinburne University, Yarra Valley Water, Bunurong LCAC	
Improving Sanitation through on-site Wastewater Management		Park Orchards		Yarra Valley Water, Councils, Environment Protection Authority (EPA)	
IWM Servicing Schemes		Metropolitan Melbourne		Yarra Valley Water, Melbourne Water, Councils, Essential Services Commission, Victorian Planning Authority (VPA), Urban Development Institute of Australia, Association of Land Development Engineers, Bunurong LCAC	
Maranoa Gardens WSUD Strategy		Balwyn		City of Boroondara, Bunurong LCAC	
Merri Creek Upper IWM Servicing Scheme Pilot		Merri Creek Upper Catchment		Yarra Valley Water, Melbourne Water, Wurundjeri Tribal Council, Hume City Council, Whittlesea City Council, Mitchell Shire Council	
Raingarden and Stormwater Harvesting - Gordon Barnard Reserve		Balwyn North		City of Boroondara, Melbourne Water	
Raingarden and Stormwater Harvesting - Macleay Park		Balwyn North		City of Boroondara, Melbourne Water	
Retarding Basin Multi-Use Outcomes		Various		Melbourne Water, Councils, water corporations, community groups, Bunurong LCAC	
Stormwater Harvesting - Monbulk Recreation Reserve		Monbulk		Yarra Ranges Council, Melbourne Water, Yarra Valley Water	



- Scale**
- Inter-forum
  - Forum Area
  - Sub-catchment
  - Growth area
  - Green wedge
  - Greenfield subdivision
  - Urban renewal
  - Lot scale



DRAFT

# Priority Portfolio of IWM Opportunities

## DRAFTING NOTE

Insert project list in detail (committed “green” projects only)

### DRAFTING NOTE - Call out box

*All the IWM opportunities included in the Priority Portfolio demonstrate value for the Yarra catchment. All projects and strategies will be enhanced and accelerated by collaboration and visibility through the IWM Forum process. They will all benefit from additional resources and support through the IWM Forum, and from generating new, or enhancing existing, cross-organisational collaboration.*

*Some projects and strategies in the Priority Portfolio offer unique additional values. These include: the potential to generate important cross-organisational learnings and capacity-building benefits for current and future IWM initiatives; the ability to be a mechanism for further IWM advocacy and policy innovation; and a contribution of substantial benefits to the region as a whole, or specifically to its iconic natural assets, including the Yarra River.*

## Biodiversity Connections for Carbon-Neutrality



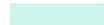
Victoria’s water authorities are committed to becoming carbon neutral. Achieving this will require various actions to reduce carbon emissions. It will also likely require some offsetting of carbon emissions.

Work has been under way over the past two years between water authorities and catchment management authorities to develop and trial arrangements that see carbon offsets being achieved through revegetation that can also provide other environmental and social benefits for local communities.

A number of potential ‘nature links’ have been identified in the Yarra catchment as priority sites for major revegetation due to their importance for connecting existing habitat and enabling movement of fauna across landscapes. These sites include areas of the Merri Creek, along the middle Yarra River, sites from Kinglake to Warrandyte, and sites at Yellingbo. Revegetation in these areas could help boost population of threatened species and increase the resilience of landscapes to future climate threats.

This collaborative project will trial a process for revegetation in the priority areas. It will also assess the costs and benefits to enable improved decision-making regarding carbon offsets through revegetation works in the future.

STATUS



LOCATION

Yarra Forum Area

COLLABORATIVE PARTNERS

Port Phillip and Westernport CMA (PPWCMA), Yarra Valley Water, Melbourne Water, Bunurong Land Council Aboriginal Corporation (LCAC)

SPATIAL SCALE



## Catchment-scale IWM Strategy



A catchment-scale IWM Strategy will support the Yarra IWM Forum Members to effectively contribute to the achievement of the Forum’s vision and strategic

STATUS



LOCATION

Yarra Forum Area

outcomes. This project will define a plan to deliver an IWM Strategy in collaboration with all Yarra IWM Forum Members and Working Group members.

A catchment-scale IWM Strategy should consider developing a framework to inform/guide investment decisions regarding place-based IWM initiatives.

COLLABORATIVE PARTNERS	Yarra IWM Forum member organisations
SPATIAL SCALE	

## Chandler Park Wetlands

This project aims to develop a constructed wetland to treat stormwater runoff from a 120-hectare urban catchment in Kew. The project proposes to divert stormwater from the Melbourne Water Kew regional drain and treat it prior to discharge to the Yarra River.

In addition to improving the health of the Yarra and Port Phillip Bay, the project will enhance wildlife habitats and create recreational and learning opportunities for site users and the wider community. The wetlands will also help minimise use of drinking water for environmental purposes.

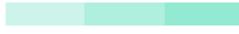
The Chandler Park Wetlands was selected as one of Boroondara’s highest priority water sensitive urban design opportunities through a multi-criteria analysis. Its strategic position within the Yarra River corridor made it a priority site amongst more than 20 potential sites for stormwater harvesting and a fit for purpose re-use asset. The removal of harmful pollutants from stormwater passing through the wetlands will ultimately support improved waterway health for the Yarra River and Port Phillip Bay.

	   
STATUS	
LOCATION	Chandler Park, Kew
COLLABORATIVE PARTNERS	City of Boroondara, Melbourne Water
SPATIAL SCALE	

## Coburg Stormwater Harvesting

The suburb of Coburg, 9 km north of Melbourne’s CBD, is a key activity centre within the Moreland City Council area. The suburb contains one of Council’s highest profile recreation reserves, Coburg City Oval, as well as two other well-used open spaces at the DeChene Reserve and McDonald Reserve. Together, these three reserves consume over 30 ML of drinking water for irrigation each year. Located on or close to a major drainage pipeline, the Harding Street Main Drain, this project leverages an opportunity to develop stormwater harvesting systems to supply stormwater for irrigation of the reserve areas.

In addition to the potable water savings and stormwater improvement outcomes, this project also explores opportunities to activate underused spaces within the reserves, using urban and landscape design to improve local amenity. Co-design approaches with project partners and community groups will ensure local values are incorporated with integrated water management

	     
STATUS	
LOCATION	Coburg
COLLABORATIVE PARTNERS	Moreland City Council, Melbourne Water, Yarra Valley Water, community groups
SPATIAL SCALE	

objectives for long-term community liveability and environmental benefits.

## Fishermans Bend IWM Plan

Fishermans Bend is Australia's largest urban renewal project covering approximately 480 hectares in the heart of Melbourne. The area will be developed to accommodate more than 80,000 residents and thousands of jobs and services. An integrated water management strategy is required for the region to ensure innovative IWM principles can help make Fishermans Bend a world-class water-sensitive region.

The plan includes a sewer mining plant to provide recycled water to all new buildings for use in toilets, laundry facilities and to irrigate open space. The plan envisions the installation of building-scale rainwater tanks to collect water from building roofs, providing flood mitigation benefits, as well as an additional source of water for non-potable uses. The Fishermans Bend IWM Plan will align with the vision and strategic outcomes of the Yarra IWM Forum.



STATUS	<div style="width: 50%; height: 10px; background-color: #4a90e2;"></div>
LOCATION	Fishermans Bend
COLLABORATIVE PARTNERS	South East Water, City of Melbourne, Melbourne Water, City of Port Phillip, Fishermans Bend Task Force, Bunurong LCAC

SPATIAL SCALE	
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## Greening the Greyfields

As populations and land values increase, many land owners are choosing to demolish their houses and subdivide their lots to accommodate more dwellings. The current trend can result in poor urban design, loss of vegetation and overdevelopment of small lots with limited liveability benefits. It can also bring an influx of new residents to an area where local infrastructure and amenities, such as public transport, parking or open space areas, cannot keep pace with growth.

Greening the Greyfields is an Australian Government-funded project aimed at resolving challenges with infill development by promoting sustainable housing regeneration in the middle suburbs.

This project will take a holistic precinct-wide approach to re-development by working with landowners and local governments to design better housing outcomes for privately owned land.

By amalgamating lots and developing complementary designs at the precinct-scale, the project explores the potential to increase the quantity, quality and diversity of housing in the Yarra catchment. It also aims to better integrate IWM principles and water-sensitive infill development practices into existing neighbourhoods.



STATUS	<div style="width: 20%; height: 10px; background-color: #4a90e2;"></div>
LOCATION	Ringwood
COLLABORATIVE PARTNERS	Maroondah City Council, Swinburne University, Yarra Valley Water, Bunurong LCAC

SPATIAL SCALE	
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## Improving Sanitation through on-site Wastewater Management

This project seeks to address the environmental and health risks posed by inadequate onsite wastewater treatment (septic) systems.

The value of on-site wastewater treatment and re-use, including for gardens and park irrigation, has historically not been permitted. However, complete or partial use of wastewater can reduce demand on potable drinking sources, and reduce costs associated with sewage. Treated wastewater can also provide local communities and property owners with a highly valued resource. This project intends to give customers greater choice and involvement in decisions regarding on-site wastewater management.

Yarra Valley Water (YVW) is currently trialling the installation, operation and maintenance of YVW-owned and operated on-site wastewater treatment systems in the Park Orchards Community Sewerage Area. Together with collaborative partners, YVW is developing an alternative to market available on-site treatment systems as a means to provide a reliable, low-operating cost, long life on-site treatment systems.



STATUS	<div style="width: 20%; background-color: #c8e6c9;"></div>
LOCATION	Park Orchards
COLLABORATIVE PARTNERS	Yarra Valley Water, Councils, Environment Protection Authority (EPA)
SPATIAL SCALE	

## IWM Servicing Schemes

This project will develop place-based IWM Servicing Plans to clearly convey planning requirements and the infrastructure investment sequencing information. It will provide a coordinated, consistent and proactive approach from water authorities, catchment managers and local governments in relation to water resources planning and management for specified areas across Metropolitan Melbourne. IWM Servicing Schemes will integrate and extend the existing management and funding frameworks to enable efficient investment decisions and support multiple benefits. Each scheme will show the planning and development requirements for each land parcel, including proposed IWM assets, such as water supply, sewer networks, flood protection, drainage requirements, and alternative water source infrastructure, and any contribution rates required from developers.

The Merri Creek Upper IWM Servicing Scheme will be the pilot project for this strategy.



STATUS	<div style="width: 20%; background-color: #bbdefb;"></div>
LOCATION	Metropolitan Melbourne
COLLABORATIVE PARTNERS	Yarra Valley Water, Melbourne Water, Councils, Essential Services Commission, Victorian Planning Authority (VPA), Urban Development Institute of Australia, Association of Land Development Engineers, Bunurong LCAC
SPATIAL SCALE	

## Maranoa Gardens WSUD Strategy

Maranoa Gardens is a prized historic botanical gardens



STATUS	<div style="width: 10%; background-color: #bbdefb;"></div>
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15-km east of Melbourne. This project investigates the development of a Water Sensitive Urban Design (WSUD) strategy to increase water use efficiency at the gardens, one of the highest water usage sites in the City of Boroondara.

A WSUD strategy for Maranoa Gardens will increase local water harvesting capabilities for use in the irrigation and maintenance of unique native landscapes through the grounds. Stormwater capture and treatment will also reduce contaminated runoff to local waterways and into Port Phillip Bay.

LOCATION	Balwyn
COLLABORATIVE PARTNERS	City of Boroondara, Bunurong LCAC
SPATIAL SCALE	

### Merri Creek Upper IWM Servicing Scheme Pilot

The Merri Creek Upper sub-catchment will be a pilot site for the implementation of IWM Servicing Schemes in a predominantly greenfield development setting.

The sub-catchment is undergoing significant development as part of the North Growth Corridor Plan to expand transport, housing, employment and lifestyle opportunities in Melbourne’s northern growth areas.

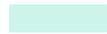
This strategy represents a pilot project for the broader IWM Servicing Scheme strategy for Metropolitan Melbourne.

      	
STATUS	
LOCATION	Merri Creek Upper Catchment
COLLABORATIVE PARTNERS	Yarra Valley Water, Melbourne Water, Wurundjeri Tribal Council, Hume City Council, Whittlesea City Council, Mitchell Shire Council
SPATIAL SCALE	

### Raingarden and Stormwater Harvesting - Gordon Barnard Reserve

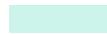
The Gordon Barnard Reserve is a popular green open space and sporting reserve in Balwyn North. This project proposes a raingarden system at the reserve to meet more than 70 per cent of its annual irrigation demands, keeping fields green and providing liveability and urban cooling benefits to the region.

The project includes the installation of a gross pollutant trap, as well as a 290m<sup>2</sup> raingarden and tertiary treatment that will remove 133 kilograms/year of total nitrogen from stormwater entering local waterways, as well as supply 7.5 ML/year of treated stormwater for reuse at the reserve.

    	
STATUS	
LOCATION	Balwyn North
COLLABORATIVE PARTNERS	City of Boroondara, Melbourne Water
SPATIAL SCALE	

### Raingarden and Stormwater Harvesting - Macleay Park

The Macleay Park raingarden system will treat stormwater from a 149-hectare urban catchment in Balwyn North. It includes a gross pollutant trap, a 450 m<sup>2</sup>

    	
STATUS	
LOCATION	Balwyn

raingarden and tertiary treatment that will remove 114 kilograms/year of total nitrogen from urban stormwater entering local waterways and eventually Port Phillip Bay. The raingarden will supply approximately 11.4 ML/year of treated stormwater for reuse at Macleay Park, about 70 per cent of its annual irrigation demand.

**COLLABORATIVE PARTNERS** City of Boroondara, Melbourne Water

**SPATIAL SCALE** 

## Retarding Basin Multi-Use Outcomes

Melbourne Water is currently developing principles and a prioritisation tool to identify when and what type of community infrastructure is appropriate at different flood retarding basin sites. There is an opportunity to partner with Councils and other organisations to implement findings from this work, and to explore recreation, open space, water harvesting and distribution outcomes.

This project will investigate opportunities for multiple and additional land uses of Melbourne Water-owned retarding basin land. Opportunities include stormwater harvesting and reuse, passive and active open space, stormwater treatment, biodiversity.

The outcomes of this strategic study could facilitate on-ground works that will require collaborations with local government, retailers and community, as well as a dataset that captures a ranking and/or prioritisation of retarding basins based on multi-use benefit opportunities, and agreed principles and a tool to guide and assess multiple land use of retarding basins for Melbourne Water.



**STATUS** 

**LOCATION** Various

**COLLABORATIVE PARTNERS** Melbourne Water, Councils, water corporations, community groups, Bunurong LCAC

**SPATIAL SCALE** 

## Stormwater Harvesting - Monbulk Recreation Reserve

The project aims to maximise stormwater as a resource and use a distribution network to irrigate sports field at Monbulk Recreation Reserve. Preliminary investigations have indicated the 14-hectare urban catchment could supply 6.4 ML/ year of water to the irrigated oval with 80 per cent reliability, reducing dependence on potable supplies to keep fields green. The project would also reduce stormwater flows to Sassafras and Emerald Creeks, improving the ecological values and water quality of these waterways.



**STATUS** 

**LOCATION** Monbulk

**COLLABORATIVE PARTNERS** Yarra Ranges Council, Melbourne Water, Yarra Valley Water

**SPATIAL SCALE** 

## Whittlesea Community Farm

This project explores the development of a proposal for the Whittlesea Community Farm and Food Distribution Network to use recycled water and other local resources to grow and provide fresh fruit, vegetables and cooked



**STATUS** 

**LOCATION** Whittlesea

**COLLABORATIVE** Yarra Valley Water, City of

food to people in need across the City of Whittlesea.

PARTNERS

Whittlesea, Whittlesea  
Community Connections

SPATIAL SCALE



## Strategic Enablers to Put IWM into Practice

The IWM Forums were established in Victoria to identify, coordinate and prioritise place-based and catchment-wide opportunities that would most benefit from collaborative water cycle planning and management.

Alongside these opportunities, the IWM Forum Members identified a range of barriers that could prevent effective implementation of IWM across metropolitan Melbourne and regional Victoria.

The DELWP Water and Catchments Group is responsible for addressing these barriers to implementation in a holistic manner alongside relevant government organisations involved in land use planning and land management.

Advisory groups drawing on industry and independent expertise support DELWP in the development and implementation of strategic initiatives to fill knowledge gaps and address issues identified through the IWM Forum process.

Barriers to IWM are reviewed, with local implications and potential state-wide resolutions discussed. These discussions will help DELWP determine potential options for policy reform and associated areas of impact for industry sectors and organisations.

Advisory groups provide advice regarding areas where planning, water, local government and other arms of government need to work more collaboratively to maintain and enhance the liveability and resilience of Victoria's cities and towns.

## **Cleaner Creeks, Everyone's Business**

The Merri Creek is prized by communities for its recreational, cultural and environmental value. But as urban and industrial development grows closer to the well-loved creek and its bushland surrounds, high levels of stormwater pollution carrying toxic solvents, heavy metals, fuels, oil and grease, have impacted the health and quality of this inner-city waterway.

To raise awareness of the impact of polluted stormwater on the Merri Creek and its receiving waters downstream, Hume City Council and Melbourne Water launched an on-site educational engagement program aimed at industrial estate businesses throughout the northern Melbourne suburbs of Campbellfield and Craigieburn.

Working off the success of a similar engagement initiative in the City of Whittlesea, Cleaner Creeks project officers visited over 200 high pollution risk businesses to encourage better work site management and pollution prevention practices with the aim of improving the quality of stormwater run-off discharged to Merri Creek.

Regular and informal site visits gave the industrial business community the opportunity to raise pollution management concerns unique to their business and together with Council officers, collaboratively negotiate practical solutions to mitigate waterway pollution.

As the educational engagement program progressed, water quality sampling revealed a reduction in the concentrations of some pollutants entering the Merri Creek. The site visits also helped initiate conversations with the industrial business community on the importance of environmental protections in industrial areas, with broader amenity improvements arising from the removal of dumped waste and vehicle wrecks in the vicinity of the Merri Creek.

Since the implementation of the Cleaner Creeks initiative, collaboration has also increased between Hume City Council and other Councils with large industrial estates, such as the City of Whittlesea and the City of Greater Dandenong, who continue to share knowledge and engagement tactics to encourage better industrial pollution and stormwater management across the region.

## **IWM in the North Growth Corridor**

Greater Melbourne's population is anticipated to grow by almost 70 per cent to around 8 million people by 2051. To accommodate this growth, more than one million new dwellings across the metropolitan area will be needed. Most residential development will take place in greenfield growth areas, including over 160,000 new dwellings estimated for the North Growth Corridor (NGC), a new housing, employment and transport growth zone extending from Craigieburn to Wallan.

Bringing water, sewerage and drainage services to these new areas presented an opportunity for Yarra Valley Water, together with Melbourne Water, local and state governments and other stakeholders, to proactively protect key waterways in the growth zone while integrating best practice water management plans through the corridor.

Following a study into alternative IWM servicing options for the corridor, the collaborative project partners found that the provision of recycled water for non-potable uses, combined with stormwater harvesting through the region, would provide maximum benefit to new communities and the environment.

The outcomes of the study have led to the development and implementation of the third-pipe recycled water scheme which, when delivered in full, will provide 6 GL/year of non-potable water to the North Growth Corridor and save costs by deferring significant water infrastructure and avoiding or significant and sewerage infrastructure. New residents and businesses will have access to recycled water for use in garden irrigation, flushing toilets and a range of other non-potable sources.

Future work in the growth corridor will involve further development of stormwater management and harvesting options to protect highly valued waterways in the north, many of which eventually flow to Port Phillip Bay.

### **Catchment-scale Stormwater Control Restores Little Stringybark Creek**

The Little Stringybark Creek is a small stream in the Dandenong Ranges, about 40 km east of Melbourne's CBD. It flows into the Stringybark Creek, which joins the Yarra River just south of Yarra Glen township. Located near grazing land, suburban residential communities and commercial industrial land, Little Stringybark Creek was known to be heavily degraded and in poor ecological condition due in part to pollutants carried through volumes of urban stormwater flowing through the catchment.

Beginning in 2008, Melbourne Water embarked on a wide-ranging stormwater control experiment with the University of Melbourne aimed at restoring the hydrology, water quality and ecological function of Little Stringybark Creek.

Together with Yarra Valley Water, Yarra Ranges Council and with support from the Victorian and Federal Governments, the experiment saw the installation of a variety of stormwater control measures, such as rainwater tanks and raingardens, across private and public land in the suburb of Mount Evelyn, located in the upper part of the Little Stringybark Creek catchment.

Through a targeted community engagement and education program, the collaborative partners provided information, financial incentives and technical support to encourage community members to effectively capture, treat and use stormwater on their property. Nearly one third of properties in the catchment took part in the experiment, installing various stormwater control measures to treat and use stormwater runoff from their land. Council also installed 88 stormwater treatment systems in the public realm, including 15 large precinct raingardens and 62 streetscape raingardens and underground infiltration systems.

Together, the public and private stormwater control measures saved around 35-50 ML/year of potable water and infiltrated about 45-60 ML of stormwater into the ground, recharging natural groundwater and stream baseflows. Researchers found that both water quality and the hydrological regime of the Little Stringybark Creek had improved, bringing the water cycle closer to its near natural state.

Amid the success of the creek restoration project, Little Stringybark Creek Environmental Significance Overlay (ESO) was developed to trial a new standard for land use planning and stormwater management. The Little Stringybark Creek ESO applied a planning control over developments in the catchment, requiring stormwater control and runoff treatment measures of all works creating more than 10m<sup>2</sup> of impervious surfaces.

To date, Melbourne Water and the Yarra Ranges Council are working to pursue the permanent adoption of the ESO requirements to continue to effectively control runoff in the catchment and protect the Little Stringybark Creek.

# Continued Success through Collaboration

IWM is an evolving process that seeks to coordinate and balance many views and interests in the water sector around common goals and agreed outcomes.

IWM Forums collaborate and oversee ongoing IWM planning. The IWM Forum cycle is summarised at right.

Phase One of the IWM Forum cycle has established an enabling environment for Victoria’s water sector stakeholders to develop shared IWM objectives and overcome sectoral, institutional and geographic boundaries through collaboration. This phase was guided by the experience and knowledge of the Forum Members.

Phase Two of the IWM Forum cycle will assume a more strategic approach to successful IWM implementation and planning for the Forum Area. This phase will include the development of a catchment-wide strategy for IWM if the IWM Forum agrees that this is suitable for the region.

Phase Two will provide an opportunity for IWM Forum Members to update relevant organisational policies, plans and strategies to reflect the outcomes of the IWM Forum.

It is anticipated that the IWM Forum collaborative partners will continue use their best endeavours to advance priority IWM initiatives through regular meetings and future Forums.

Forum Members will continue to collaboratively progress the IWM opportunities identified in Phase One but not yet committed at the time of publication of this SDS (refer to Appendix).

Phase Two will create an opportunity to evaluate and share learnings from Phase One to benefit stakeholders. It will also optimise resources and explore the development of innovative tools and approaches that plan for, and respond to, water demand in the future.

**DRAFTING NOTE**

Insert stylised illustration which conveys phase 1 and 2 (forthcoming.)

	Outcomes	Participants
 <p><b>Establish</b></p> <p>Organisational leaders come together in collaborative IWM Forums to discuss integrated water management opportunities and priorities for each region</p>	<p>Preliminary work on regional characterisation (offline, where necessary)</p> <p>Agree vision and objectives, goals &amp; targets (where appropriate)</p> <p>Agree criteria for selection and prioritisation of opportunities</p> <p>Opportunities identified and prioritised</p> <p>IWM Plan Working Groups form to progress priority projects and build intra-organisational support (offline)</p>	<p>Local governments</p> <p>Catchment Management Authorities</p> <p>Water corporations</p> <p>Department of Environment, Land, Water and Planning</p> <p>Chair</p> <p>Others as relevant</p>
↓		
 <p><b>Develop</b></p> <p>Working groups will form to develop IWM Plans for prioritised projects</p>	<p>IWM Plan Working Groups develop objectives, place-based outcomes, and service levels for each project</p> <p>Technical and economic analysis; cost allocation; business case development into a 'prospectus' to attract investment</p> <p>IWM Plan Working Groups plan project delivery; report progress to IWM Forums</p>	<p>Relevant organisations who are a part of a sub group</p>
↓		
 <p><b>Incorporate</b></p> <p>Organisations incorporate relevant elements of IWM Plans in their own planning system, e.g. Council and corporate plans</p>	<p>IWM Plan Working Groups to take commitments to their Board or Councillors for endorsement</p> <p>IWM Plan Working Groups to incorporate elements into their own organisational planning systems</p> <p>Report back to IWM Forum and prepare for next round of opportunity identification and prioritisation</p>	<p>Individual organisations who have committed to a project</p>
↓		
 <p><b>Deliver</b></p> <p>IWM Plans are implemented</p>	<p>IWM Plans implemented</p> <p>Additional community value added through collaborative planning</p> <p>Economic savings through shared costs</p> <p>Improved resilience and liveability of cities and towns</p>	<p>Individual organisations who have committed to a project</p>

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**IWM Forums collaborate and oversee ongoing IWM planning**

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# Appendix

## IWM Opportunities in the Yarra catchment

The following list of IWM opportunities was identified by the Yarra IWM Forum in the first phase of the Forum cycle. At the time of publication, these opportunities were not yet committed by the collaborative partners to be progressed in the next 12-18 months.

### DRAFTING NOTE

Insert stylised long list of projects

However, they are indicative of important IWM opportunities for the catchment and represent potential future priorities for the Yarra IWM Forum.

Further assessment of these opportunities will be required to achieve commitment by the Forum.

IWM Opportunity	Collaborative Partners	Strategic Outcome Areas
Albert Park Lake Stormwater Harvesting	City of Melbourne, City of Port Phillip, Parks Victoria	    
Alternative Water Supply - Royal Botanic Gardens	City of Melbourne, Melbourne Water, City West Water, Royal Botanic Gardens	   
Best Practice Stormwater Management from Public Realm	Moreland City Council, Victorian Planning Authority, Environment Protection Authority (EPA), Melbourne Water, Councils	     
Coldstream Water Recycling Scheme	Yarra Ranges Council, Melbourne Water, Yarra Valley Water, Traditional Owners, agricultural property owners	     
Consistency of Drainage Policy	City of Whitehorse, Municipal Association of Victoria (MAV), Councils	   
Drinking Water Quality Improvements	Melbourne Water, Port Phillip and Westernport Catchment Management Authority (PPWCMA), Yarra Valley Water, agricultural landowners, Yarra Ranges Council	    
Edwardes Lake Stormwater Harvesting	Darebin City Council, Merri Creek Management committee, Friends of Edgars Creek, Melbourne Water, Whittlesea City Council, Yarra Valley Water	     
Flood Protection Smart Technology	Maroondah City Council, Melbourne Water	   
Gardiners Creek Revitalisation	City of Monash, City of Whitehorse, Melbourne Water	    
Greater Broadmeadows IWM Plan	Yarra Valley Water, Victorian Planning Authority (VPA), Hume City Council, Melbourne Water	      
Hazelwynde Water Sensitive Community	Yarra Valley Water, Mitchell Shire, VPA, Melbourne Water, developers, community	      
Lilydale Quarry Development - Kinley	Yarra Valley Water, Yarra Ranges Council, Melbourne Water, land	      

	owners and developers	
Land Subject to Inundation Overlay Update	Melbourne Water, City of Melbourne, Councils	   
Maximising the Value of Reticulated Sewerage in Monbulk	Yarra Valley Water, Yarra Ranges Council, EPA	     
Modelling Effectiveness of Distributed Flood Storages and Pilot Project North East Road Link	Melbourne Water, Councils, Yarra Valley Water, South East Water North East Link Authority, DELWP, Melbourne Water, Councils, Yarra Valley Water, landowners, communities, Traditional Owners	    
Plan for Flood Protection from Sea Level Rise	City of Melbourne, Melbourne Water, Fishermans Bend Task Force, City of Port Phillip	   
Planning Controls Strengthened to Regulate Discharge from Sites	Melbourne Water, Councils, MAV, VPA	    
Reservoir Wetlands	Darebin City Council, Melbourne Water, Yarra Valley Water, community groups	     
Sewer Heat Recovery	City West Water, Melbourne Water, Yarra Valley Water, private and public industry	  
Stormwater Harvesting for a Variety of Uses in the Northern Growth Corridor	Yarra Valley Water, Melbourne Water, Hume City Council, Mitchell Shire Council, Whittlesea City Council, VPA	     
Swift Parrot Landscape Protection	PPWCMA, Landcare groups	  
Update of STORM Tool	Melbourne Water, DELWP, City of Port Phillip, Councils	    
Urban Cooling Program	Melbourne Water, Councils	   
Wallan Restorative Project	Yarra Valley Water, Melbourne Water, Merri Creek Management Committee, Mitchell Shire Council, Wurundjeri LCCHCAC, Friends of Merri Creek, Wallan Environment Group	  
Warburton Hospital Development IWM Opportunities	Yarra Valley Water, Yarra Ranges Council, Melbourne Water, developers	    
Waste to Energy Project - Lilydale	Yarra Valley Water, Yarra Ranges Council	    
WSUD Asset Management Process Mapping and Gap Analysis	City of Boroondara, City of Casey, City of Monash, City of Whitehorse, Melbourne Water	   
Yarra Catchment Nature Links	PPWCMA, Melbourne Water, Councils, Landcare groups	   

## Glossary of Terms

**Aboriginal Victorians:** An Aboriginal Victorian is a person of Aboriginal descent who identifies as an Aboriginal and is accepted as such by the Victorian Aboriginal community in which he or she lives.

**Algal blooms:** A rapid increase in the population of algae that can occur in waterways, often caused by excess nutrients (particularly phosphorus and nitrogen).

**Allocation:** Water that is actually available to use or trade in any given year, including new allocations and carryover.

**Assets:** Assets are resources that provide benefit. This includes, for example, infrastructure such as treatment plants, pipes and pumps, water assets such as dams, bores and wetlands, and community assets such as sporting facilities, public gardens and street trees. Natural assets are assets of the natural environment, for example waterways and vegetation, also known as natural capital.

**Aquifer:** An underground layer of rock or sediment that holds water and allows water to flow through it.

**Biodiversity:** The numbers and variety of plants, animals and other living beings, including micro-organisms, across our land, rivers and oceans. It includes the diversity of their genetic information, the habitats and ecosystems in which they live and their connections with other life forms.

**Catchment:** An area where water falling as rain is collected by the landscape, eventually flowing to a body of water such as a creek, river, dam, lake or ocean; or into a groundwater system.

**Catchment management authorities (CMAs):** The *Catchment and Land Protection Act 1994* established 10 catchment and land protection regions, each with a catchment management authority responsible for the integrated planning and coordination of land, water and biodiversity management.

**Central business district (CBD):** Melbourne's original 'Hoddle Grid' street layout bounded by the Yarra River, Spring Street, La Trobe Street and Spencer Street, as well as the triangular area to the north bounded by Victoria, Peel and La Trobe streets.

**Climate change:** A long-term change of the earth's temperature and weather patterns, generally attributed directly or indirectly to human activities such as fossil fuel combustion and vegetation clearing and burning.

**Climate change mitigation:** Actions that prevent or reduce emissions of greenhouse gases that contribute to climate change.

**Coastal flooding:** Inundation along the coastline mainly due to flooding from the sea associated with storm surge. It may also include additional flooding caused by heavy rainfall.

**Community:** Includes individuals, public and private landholders, community groups and business owners.

**Connectivity:** Connections between natural habitats, such as a river channel and adjacent wetland areas. Connectivity is a measure or indicator of whether a waterbody (river, wetland, floodplain) has water connections or flow connections to another body.

**Department of Environment, Land, Water and Planning (DELWP):** Supports Victoria's natural and built environment to ensure economic growth and liveable, sustainable and inclusive communities. The Water and Catchments group of the Department assists the Minister for Water, develops and implements state policies and programs, and oversees the administration of organisations including catchment management authorities.

**Ecosystem:** A dynamic complex of plant, animal, fungal and microorganism communities and the associated non-living environment interacting as an ecological unit.

**Entitlement (or water entitlement):** Authorisation to take water issued in accordance with the *Water Act 1989*. It includes bulk entitlements, environmental entitlements, water shares, and surface water and groundwater licences (also known as take and use licences).

**Environmental water:** Water to support environmental values and ecological processes.

**Gigalitre:** One billion (1,000,000,000) litres. One gigalitre is the equivalent of approximately 400 Olympic size swimming pools.

**Green-blue infrastructure:** Green infrastructure refers to key vegetation features such as street trees, parklands, grassed sports fields and vegetated walls. Blue infrastructure refers to key waterways, wetlands, recreational lakes, stormwater retarding basins, or other water body features. Green-blue infrastructure brings these assets together through integrated approaches to deliver community benefits.

**Greenfield land:** Undeveloped land identified for residential or industrial/commercial development, generally on the fringe of metropolitan Melbourne.

**Groundwater:** All subsurface water, generally occupying the pores and crevices of rock and soil.

**Growth areas:** Locations on the fringe of metropolitan Melbourne designated in planning schemes for large-scale transformation, over many years, from rural to urban use.

**Fit for purpose (water quality):** Water of a quality that is appropriate for its intended use.

**Flash flooding:** Sudden and unexpected flooding caused by sudden local heavy rainfall or rainfall in another area. Often defined as flooding which occurs within six (6) hours of the rainfall event.

**Floodplain:** Low-lying land adjacent to a river or stream with unique ecosystems dependent on inundation from flood events.

**Flow:** Movement of water – the rate of water discharged from a source, given in volume with respect to time.

**Heritage River Area:** Land in particular parts of rivers and river catchment areas in Victoria which have significant nature conservation, recreation, scenic or cultural heritage values. These areas are identified and protected under the *Heritage Rivers Act 1992*. There are 18 Heritage River Areas in Victoria.

**Infill:** Development of unused or underutilised land in existing urban areas.

**Infrastructure:** Basic facilities and networks needed for the functioning of a local community or broader society.

**Irrigation district:** An area declared under the *Water Act 1989* that is supplied with water by channels and pipelines used mainly for irrigation purposes.

**Liveability:** A measure of a city's residents' quality of life, used to benchmark cities around the world. It includes socioeconomic, environmental, transport and recreational measures.

**Impervious area:** A surface or area within a catchment that significantly restricts the infiltration of water. Impervious surfaces can include concrete, road surfaces, roofs and saturated ground such as a lake or pond.

**Integrated water management (IWM):** A collaborative approach to planning that brings together all elements of the water cycle including sewage management, water supply, stormwater management and water treatment, considering environmental, economic and social benefits.

**Integrated Water Management Forum:** A meeting of urban water management organisations to identify, prioritise and commit to the investigation of integrated water management opportunities.

**Integrated water management opportunity:** A servicing need that has the potential to leverage broader benefits when undertaken collaboratively, using an integrated water management approach.

**Megalitre (ML):** One million (1,000,000) litres.

**Metropolitan Melbourne:** The 31 municipalities that make up metropolitan Melbourne, plus part of Mitchell Shire within the urban growth boundary.

**National employment and innovation clusters (NEIC):** Designated concentrations of employment distinguished by a strong core of nationally significant knowledge sector businesses and institutions that make a major contribution to the national economy and Melbourne's positioning in the global economy.

**Open space:** Includes land reserved for natural landscape, parklands, recreation and active sports, as well as waterways and bays.

**Potable:** Water of suitable quality for drinking.

**Productivity:** The economic value produced for an hour of work or a dollar of investment. Increasing productivity is a key source of economic growth and competitiveness.

**Rainwater:** Water that has fallen as rain or has been collected from rainfall.

**Ramsar Convention:** Defined by section 4 of the Commonwealth *Water Act 2007* as the Convention on Wetlands of International Importance especially as Waterfowl Habitat done at Ramsar, Iran, on 2 February 1971.

**Ramsar wetlands:** Wetlands of international importance, designated under the Ramsar Convention.

**Recreational water or recreational benefits:** The objectives and benefits that recreational users and community members associate with the use of water, reservoirs and waterways for recreational activities. These objectives and benefits include wellbeing and enjoyment, derived from social interaction, physical activity and relaxation associated with activities including sporting events, fishing, water skiing and rowing, camping, walking and gathering with friends and family. It also includes flow-on economic benefits to local communities from visitors to regional areas to make the most of these opportunities.

**Recycled water:** Water derived from sewerage systems or industry processes that is treated to a standard appropriate for its intended use.

**Regional Victoria:** Includes all municipalities outside metropolitan Melbourne (except part of Mitchell Shire within the urban growth boundary).

**Reservoir:** Natural or artificial dam or lake used for the storage and regulation of water.

**Resilience:** The capacity of individuals, communities, institutions, businesses, systems and infrastructure to survive, adapt and grow, no matter what chronic stresses or shocks they encounter.

**Riparian:** Refers to land or vegetation that adjoins a river, creek, estuary, lake or wetland.

**Riverine flooding:** Inundation of normally dry land occurring when water overflows the natural or artificial banks of a creek or river. Also called main channel flooding.

**Runoff:** The portion of rainfall which actually ends up as streamflow, also known as rainfall excess.

**Sewage:** Wastewater produced from households and industry.

**Sewerage:** The pipes and plants that collect, remove, treat and dispose of liquid urban waste.

**State-significant industrial precincts (SSIP):** Strategically located land available for major industrial development linked to the Principal Freight Network and transport gateways.

**Stormwater:** Runoff from urban areas. The net increase in runoff and decrease in groundwater recharge resulting from the introduction of impervious surfaces such as roofs and roads within urban development.

**Stormwater flooding:** Inundation by local runoff. Stormwater flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing the urban stormwater drainage system to overflow.

**Traditional Owners:** People who, through membership of a descent group or clan, are responsible for caring for Country. Aboriginal people with knowledge about traditions, observances, customs or beliefs associated with a particular area. A Traditional Owner is authorised to speak for Country and its heritage.

**Urban greening:** Growing plants wherever possible in cities to contribute to urban vegetation coverage, and providing a connection to nature.

**Urban heat-island effect:** When the built environment absorbs, traps, and in some cases directly emits heat, causing urban areas to be significantly warmer than surrounding non-urban areas.

**Urban renewal:** The process of planning and redeveloping underutilised medium and large-scale urban areas, precincts or sites for mixed land-use purposes.

**Urban water cycle:** The cycle of water through urban environments. Distinguished from the natural urban water cycle by the transfer of water through built infrastructure and the high runoff rates generated by impervious surfaces.

**Use (water use):** The volume of water diverted from a stream or groundwater bore. It is not the same as 'use' by the end consumer of the water.

**Wastewater:** Water that has had its quality affected by human influence, deriving from industrial, domestic, agricultural or commercial activities.

**Water corporations:** Victorian Government organisations charged with supplying water to urban and rural water users. They administer the diversion of water from waterways and the extraction of groundwater. Formerly known as water authorities.

**Water infrastructure:** Facilities, services and installations needed for the functioning of a water system.

**Water sector:** Organisations involved in water management, including water corporations, local government and catchment management authorities.

**Water sensitive urban design (WSUD):** Integrating the urban water cycle into urban design to minimise environmental damage and improve recreational and aesthetic outcomes.

**Waterways:** Rivers and streams, their associated estuaries and floodplains (including floodplain wetlands) and non-riverine wetlands.

**Waterway condition/waterway health:** Waterway condition (or waterway health) is an umbrella term for the overall state of key features and processes that underpin functioning waterway ecosystems (such as species and communities, habitat, connectivity, water quality, riparian vegetation, physical form, and ecosystem processes such as nutrient cycling and carbon storage).

**Wetlands:** Areas, whether natural, modified or artificial, subject to permanent or temporary inundation, that hold static or very slow-moving water and develop, or have the potential to develop, biota adapted to inundation and the aquatic environment. Wetlands may be fresh or saline.